

In-situ / In-flight Detection of Fluorescent Proteins Using Imaging Spectroscopy Sensors, Phase I

Completed Technology Project (2004 - 2004)



Project Introduction

Recent advances in molecular biology have offered promising opportunities for developing high-value transgenic plant materials that originally have no commercial utilities and for producing recombinant proteins in transgenic plants. Such plant genetic engineering will not only benefit the agricultural industry by creating elite crop varieties with improved qualities and unique features but also benefit the pharmaceutical industry by developing plant-based antibodies and vaccines, which is cost-effective and safe. A fundamental requirement for the development of transgenic plant materials is to have an effective gene transfer system, which is able to produce high transformation events. Literature survey shows that existing transformation technologies face severe challenges with most of monocots and dicots cultivars. However, gene transfer experiments conducted by WCSAR during STS-95 and STS-101 showed that the transformation rates were significantly higher than the same experiments conducted on ground, which opened a door for the commercial investment of space-based plant genetic research facilities. The challenge is to develop in-flight analytical capability so that the science return is less dependent on the post mission process/analysis and the success of each flight. For example, the gene transfer experiment WCSAR conducted during STS-107 experienced 100% science loss due to the lack of analytical data during the flight. The goal of this proposal is to develop an automated and ground-based controlled ISS-based research tool that is able to in-situ detect fluorescent proteins, the reporter genes widely used for in-vivo monitoring gene expression, using active imaging spectroscopy sensors. Such technology can be incorporated into existing research facilities to enhance the science return, and minimize crew involvement time. This is crucial to research fields of plant transformation, gene manipulation (sequencing/knocking out), and plant genomics.



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

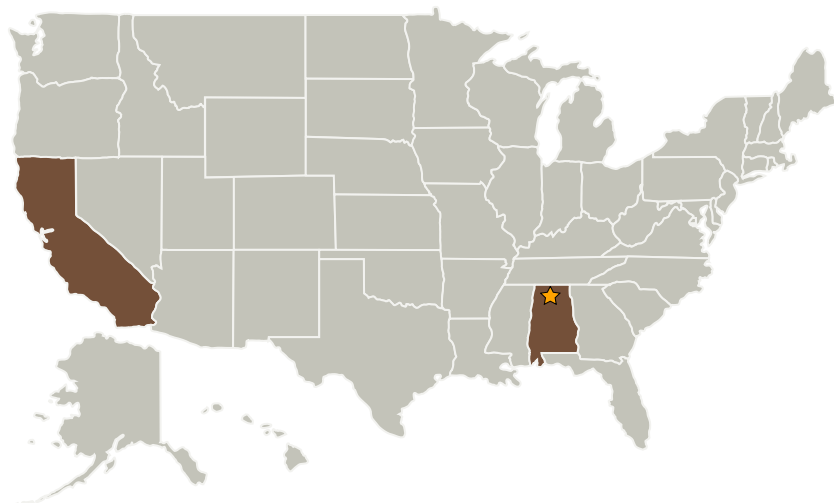
Small Business Innovation Research/Small Business Tech Transfer

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Marshall Space Flight Center (MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Opto-Knowledge Systems, Inc. (OKSI)	Supporting Organization	Industry	Torrance, California

Primary U.S. Work Locations

Alabama	California
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigators:

Jim Chamberlain

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Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.3 Human Health and Performance
 - └ TX06.3.1 Medical Diagnosis and Prognosis